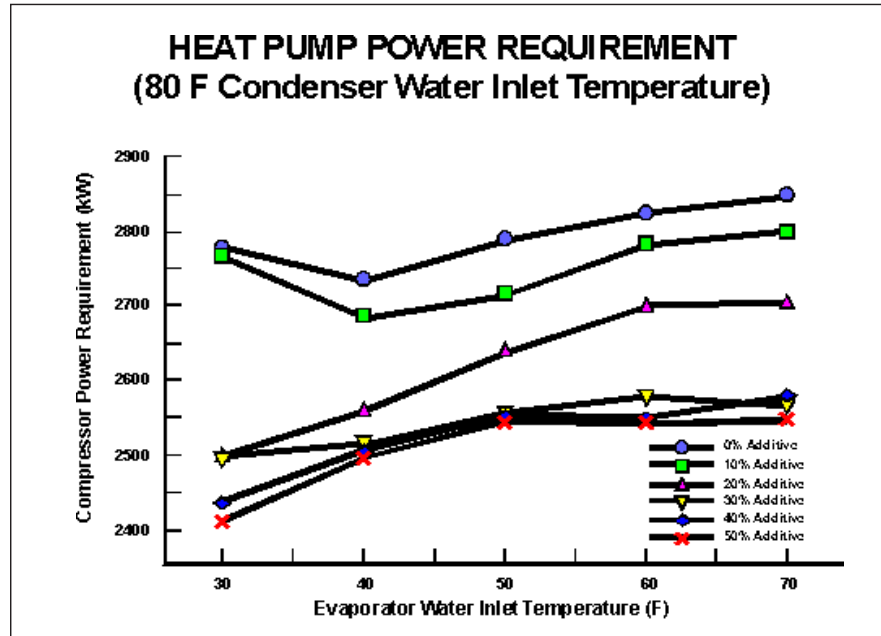




NEW ADDITIVE FOR VAPOR-COMPRESSION HEAT PUMPS ENHANCES PERFORMANCE

47



Payoff

The addition of the additive (patent-pending) to the lubricant of small (less than 10 ton) heat pumps will increase performance and improve lubrication. The 20 percent heat pump energy savings that can be achieved will positively impact the Air Combat Command's mobile airbase thrust to locate an airbase anywhere and the commercial heat pump, air conditioning and chiller markets.

Accomplishment

Under a Small Business Innovation Research program sponsored by the Propulsion Directorate, Mainstream Engineering Corporation of Rockledge FL developed a performance-enhancing additive (absorbent fluid) that when added to a standard refrigeration system results in a decrease in the systems energy consumption, providing a significant increase in the coefficient of performance (COP). The additive is nontoxic, nonflammable, nonvolatile and has a freezing point well below the normal freezer operating range.

Background

To determine the impact of the additive, when added to polyester (POE) lubricant and tetrafluoroethane (HFC-134a) refrigerant, on a conventional compressor, Mainstream Engineering performed experiments using a commercial reciprocating refrigeration compressor. These experiments used a 3/4 hp semi-hermetic reciprocating compressor, a hand expansion valve, a liquid-to-refrigerant evaporator and an air-cooled condenser. A series of experiments using no absorbent were performed to develop baseline performance data. The absorbent was then introduced to the tests by mixing it directly with the POE lubricant and adding the mixture to the compressor crank case. The test results showed that the addition of the additive resulted in increased COP with no adverse effect on the compressor. The additive has demonstrated benefits in vapor compression heat pumps operating with tetrafluoroethane and chorodifluoromethane refrigerants. The test results suggest these benefits are achieved whether or not the additive is soluble in the lubricant. The addition of the additive to the system did not degrade the lubrication/wear characteristics of the oil or have a negative impact on compressor life.